ANALOG/DIGITAL AUDIO CONVERTER AND A METHOD THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. application Ser. No. 14/590,336, filed on Jan. 6, 2015, which is a continuation of U.S. application Ser. No. 11/116,287 filed on Apr. 28, 2005, now U.S. Pat. No. 8,954,171, issued on Feb. 10, 2015, which claims the priority benefit under 35 U.S.C. §119 of Korean Patent Application No. 10-2004-0090653, filed on Nov. 9, 2004, in the Korean Intellectual Property Office. The disclosures of all of the above applications are incorporated herein in their entirety by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present general inventive concept relates to an analog/digital audio output apparatus. More particularly, the present general inventive concept relates to an audio output apparatus to enable reception of an analog audio signal in a digital broadcasting receiving apparatus through an external receiver.

[0004] 2. Description of the Related Art

[0005] Audio signals received and processed in a digital broadcasting receiving apparatus comprise AC-3 and moving picture experts group (MPEG) data, which are decoded using a software codec capable of compressing and playing a digital audio signal processed by a digital signal processor (hereinafter, referred to as "digital audio DSP"), or without a dedicated hardware, and analog-processed to be output through a speaker. If being provided with a dedicated external audio/video (AV) receiver, a user can output the AC-3 and the MPEG data received through the digital broadcasting receiving apparatus as a digital signal without causing any loss of the data, connect the digital broadcasting receiving apparatus to the external A/V receiver, decode the digital signal at the digital audio DSP in the external A/V receiver and output the decoded signal through a speaker. Among digital audio interfaces for the above operations, a SONY®/PHILIPS® digital interface (SPDIF) is a prevailing one for domestic use.

[0006] The SPDIF has a digital output standard produced by SONY® corporation and ROYAL PHILIPS® Electronics, and FIG. **1** schematically shows a block diagram of a conventional digital broadcasting receiving apparatus for processing a digital output of the SPDIF. Referring to FIG. **1**, the conventional digital broadcasting receiving apparatus mainly comprises a digital processing part and an analog processing part.

[0007] The digital processing part comprises a tuner **10** for receiving a channel from an external sky wave, a cable, and a satellite, a channel demodulator (demod) **20** for outputting a transport stream (TS) corresponding to the received channel, a multimedia processor **50** including a TS demultiplexer (demux), an MPEG decoder and a graphic mixer, a controller (CPU) **40** for controlling the overall system, and a digital audio DSP **60** for processing the digital audio. The multimedia processor **50** outputs an image as a video out signal, a super video (S-video) out signal, or a digital video interactive (DVI) signal.

[0008] The digital audio DSP **60** outputs the SPDIF output (digital out) to the outside or transmits a digital audio signal to a national television system committee (NTSC) audio decoder **70** so as to enable a user to listen to the digital audio signal through an external speaker.

[0009] In general, the conventional digital broadcasting receiving apparatus is able to receive and process conventional analog broadcasting. Here, an audio signal in such a conventional analog broadcasting is in accordance with the NTSC.

[0010] The analog processing part comprises an NTSC intermediate frequency (IF) converter or decoder **30** for converting the channel received by the tuner **10** into an IF signal and the NTSC audio decoder **70** for processing the NTSC audio signal, that is, the IF signal. Also, even an externally input audio signal is input to the NTSC audio decoder **70** so as to be processed to the left or the right according to a user's choice and transmitted as a L/R out signal to the external speaker. The NTSC IF converter **30** outputs an NTSC video signal to the multi-media processor.

[0011] In the conventional digital broadcasting receiving apparatus as described above, the NTSC audio signal is volume-controlled by the NTSC audio decoder **70**, output to the left or the right and input to the speaker or other external devices, such as a video cassette recorder (VCR) for recording.

[0012] The user utilizing the external receiver (not shown) connects the SPDIF output from the digital audio DSP **60** of the digital broadcasting receiving apparatus to an input terminal of the external receiver and decodes the SPDIF in a digital audio DSP of the external receiver to thereby listen to the sound through the external speaker. Usually, volume of the conventional digital broadcasting receiving apparatus is set to '0' because the volume of the digital broadcasting receiving apparatus is turned down when receiving through the external receiver.

[0013] In a case of converting the channel to the NTSC signal or receiving the external input audio signal, such as from the VCR, the audio signal at this time is in the analog form, and therefore, the user needs to turn up the volume of the conventional digital broadcasting receiving apparatus to listen to the sound.

[0014] In other words, when the digital broadcasting receiving apparatus is receiving NTSC broadcasting or processing an input from the external VCR, the user who uses a separate receiver having the digital audio DSP suffers an inconvenience of turning up the volume of the conventional digital broadcasting receiving apparatus which is primarily set to '0', in order to listen to the sound through the external speaker.

SUMMARY OF THE INVENTION

[0015] The present general inventive concept provides an apparatus capable of converting an analog audio signal to a digital audio signal and outputting the digital audio signal through a SONY®/PHILIPS® digital interface (SPDIF), such that a user who utilizes a dedicated receiver having a digital audio digital signal processor (DSP) therein is able to listen to the analog audio signal through an external speaker.

[0016] Additional aspects and advantages of the present general inventive concept will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the general inventive concept.

[0017] The foregoing and/or other aspects and advantages of the present general inventive concept may be achieved by